

# PATENT COOPERATION TREATY PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference DGC DAA 02 1355 7401	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No.  <b>PCT/AU2003/001476</b>	International Filing Date <i>(day/month/year)</i> 7 November 2003	Priority Date <i>(day/month/year)</i> 7 November 2002
International Patent Classification (IPC) or national classification and IPC  Int. Cl. <sup>7</sup> C12N 5/08, 5/10		
Applicant JOHNSON & JOHNSON RESEARCH PTY LIMITED et al		

1.	This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.																
2.	This REPORT consists of a total of 5 sheets, including this cover sheet.  <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of 8 sheet(s).																
3.	This report contains indications relating to the following items: <table style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 30px;">I</td> <td><input checked="" type="checkbox"/> Basis of the report</td> </tr> <tr> <td>II</td> <td><input type="checkbox"/> Priority</td> </tr> <tr> <td>III</td> <td><input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td>IV</td> <td><input type="checkbox"/> Lack of unity of invention</td> </tr> <tr> <td>V</td> <td><input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td>VI</td> <td><input type="checkbox"/> Certain documents cited</td> </tr> <tr> <td>VII</td> <td><input type="checkbox"/> Certain defects in the international application</td> </tr> <tr> <td>VIII</td> <td><input checked="" type="checkbox"/> Certain observations on the international application</td> </tr> </table>	I	<input checked="" type="checkbox"/> Basis of the report	II	<input type="checkbox"/> Priority	III	<input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	IV	<input type="checkbox"/> Lack of unity of invention	V	<input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	VI	<input type="checkbox"/> Certain documents cited	VII	<input type="checkbox"/> Certain defects in the international application	VIII	<input checked="" type="checkbox"/> Certain observations on the international application
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Date of submission of the demand 28 May 2004	Date of completion of the report 11 February 2005
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**I. Basis of the report**

1. With regard to the elements of the international application:\*
- ☐ the international application as originally filed.
- ☒ the description, pages 1, 2, 4-10, 12-20, 23-33, 35-38 , as originally filed,  
pages , filed with the demand,  
pages 3, 11, 21, 22, 34 , received on 27 January 2005 with the letter of 25 January 2005
- ☒ the claims, pages 39-47, as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages , received on with the letter of
- ☒ the drawings, pages 1/4-4/4 , as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☒ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages 1-3 , received on 27 January 2005 with the letter of 25 January 2005
2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.  
These elements were available or furnished to this Authority in the following language which is:
- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).
3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished
4. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.
5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims 1-65	YES
	Claims	NO
Inventive step (IS)	Claims None	YES
	Claims 1-65	NO
Industrial applicability (IA)	Claims 1-65	YES
	Claims	NO

**2. Citations and explanations (Rule 70.7)**Citations

- D1 WO 01/94944 A2 (MEMORIAL SLOAN-KETTERING CANCER CENTER) 13 December 2001
- D2 Zeiling Cai et al. Transfected Drosophila cells as a probe for defining the minimal requirements for stimulating unprimed CD8<sup>+</sup> cells. Proc Nat Acad Sci USA, 1996. 93:14736-41.
- D3 WO 99/37313 A1 (GENZYME CORPORATION) 29 July 1999
- D4 Lun Quan Sun et al. Resistance to human immunodeficiency virus type I infection conferred by transduction of human peripheral blood lymphocytes with ribozyme, antisense, or polymeric trans-activation response elements. Proc Nat Acad Sci USA, 1995. 92: 7272-76.

Novelty.

The prior art does not disclose a method of producing virus-specific CTLs that has all the features of the method of claim 1. Thus, all claims are novel.

Inventive Step.

The problem of present invention is to provide methods for producing cytotoxic T lymphocytes with activity against cells infected by specific viruses.

The solution provided in the present application is the provision of non-naturally occurring antigen presenting cells (nnAPCs), which are used to prime CD8<sup>+</sup> cells for virus-specific cytotoxic lymphocyte (CTL) activity. The nnAPCs of the examples of the description are admitted by the applicants to be known (see Example 1). The nnAPCs are loaded with viral peptide fragments comprising immunostimulatory epitopes that stimulate CTL activity. The antigens are presented to CD8<sup>+</sup> cells by incubating nnAPCs with CD8<sup>+</sup> cells in the presence of "supportive" cytokines.

The CTLs may also be transformed with a variety of virus inhibiting nucleic acids. The CD8<sup>+</sup> cells may be co-incubated with monocytes that present at least one antigen presented by the nnAPCs. The nnAPCs may also be used to prime CD4<sup>+</sup> cells and CD34<sup>+</sup> cells, which are co-administered with the virus-primed CTLs.

Continued in supplemental Box V

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

1. The claims are not clear

- (i) Claim 10 is not clear. Adherent cells are a feature only of claim 3, not necessarily of claims 4-9.
- (ii) Claim 12 is not clear. The term "the method of any one of claim 3" cannot be given a meaningful construction.
- (iii) Claim 47 is not clear. Claim 38 does not mention adherent cells.

2 The claims are not fully supported by the description.

- (i) The description only discloses nnAPCs produced from *Drosophila* cells. However, the term nnAPC of the claims encompasses any non-naturally occurring or artificial antigen presenting cell.
- (ii) The description only discloses nnAPCs that are loaded with antigenic peptides that they present to CD8<sup>+</sup> cells by incubation with the antigenic peptides. However, claim 1 encompasses any non-naturally occurring antigen presenting cell that presents specific viral antigenic peptides, however produced. It encompasses, for example, nnAPCs transformed with viral peptides.
- (iii) In the examples of the description, the applicants have disclosed methods for making nnAPCs, loading such cells with known viral epitopes, and using them to activate virus-specific CTLs. They have disclosed further method steps, including incubation of CTLs with Il-2 and Il-7, transduction of CTLs with ribozymes, and further stimulation of CTLs with irradiated monocytes which have been pulsed with at least one virus-specific epitope.

However, the applicants have not disclosed that the nnAPCs have actually been made, or used to activate CTLs according to the methods of the claims. Nor have they disclosed actual production of CTLs transduced with ribozymes, or further activation of CTLs using irradiated monocytes. Since the cells have not been made, they have not been tested for any activity. Nor is the use of these CTLs to treat viral diseases disclosed. Claims to putative methods that are not disclosed as having been tested or shown to achieve the result to which they are directed can only be considered speculative.

**Supplemental Box V**

(To be used when the space in any of the preceding boxes is not sufficient)

**Continuation of Inventive Step**Inventive Step (cont'd).

D1 and D2 both disclose nnAPCs and their use for presenting specific antigens to CTLs that enable the CTLs to specifically target cells displaying these antigens.

D1 discloses nnAPCs derived from mouse fibroblasts and discloses their use in methods of presenting antigens to activate cytotoxic T lymphocytes. Example 9 of the citation discloses nnAPCs engineered to express a flu viral peptide, and the use of such nnAPCs to prime cytotoxic lymphocytes. It also discloses cells transformed with more than one antigen.

In so far as the claims are matter not disclosed in the citation, the following features are not considered to provide invention. It is not considered inventive to use known cytokines that have known stimulatory effects on CTLs. It is well known that CTLs can be primed by monocytes, as well as by dendritic cells, and there is no disclosure that any unexpected improvement is gained by this step, which is therefore not considered to provide invention. Similarly, the use of antigen presenting cells to prime helper T cells is well known, and not considered to provide invention.

Claims 1-3, 10-16, 35-40, 52-56, 60-65 lack invention over D1.

D2 discloses nnAPCs derived from *Drosophila* cells, and loaded with antigenic peptides to activate CTLs against specific target cells displaying the antigenic peptides. It is accepted that the citation does not specifically teach loading viral antigens onto the artificial antigen presenting cells. However, one skilled in the art would be aware that CTLs are active against virus-infected cells, and find it obvious to extend the methods of the citation to the production of antiviral CTLs.

Therefore, similarly to objections to the claims over D1, claims 1-3, 10-16, 35-40, 52-56, 60-65 lack invention over D2.

D3 discloses nnAPCs generated by fusing dendritic cells to cells expressing specific antigens. The cells are used to generate antigen specific CTLs. The CTLs may be transformed with ribozymes or antisense molecules. The citation teaches use of such cells against tumours. However, since it is well-known that CTLs are effective against virus-infected cells, the use of viral antigens instead of tumour antigens cannot be considered to provide invention to the present claims.

It is also accepted that nnAPCs generated from fusion of antigen expressing cells to dendritic cells are very different from nnAPCs generated from transforming *Drosophila* cells with HLA molecules. However, the claims are not limited to nnAPCs produced by any particular methods, and the APCs of the citation are certainly non-naturally occurring.

Similarly to objections in light of D1 and D2, and in so far as the nnAPCs of the claims encompass the artificial APCs of D3, all claims lack invention over D3.

D4 discloses transduction of human peripheral blood cells with antiviral ribozymes, to improve activity against virus infected cells. It is considered obvious to combine the teachings of D4 with those of D1 and D2, as all citations are specifically directed to producing T cells active against virus infections.

Therefore claims 4-9, 17-34, 41-51, 57-59 lack inventive step over D1 or D2 in light of D4.

It is noted that it is difficult to concede invention to method claims, even where they differ from methods of the prior art, where there is no disclosure that the claimed methods result in any unexpected improvement over the methods of the prior art.